THE INFLUENCE OF LIGHT UPON THE GERMINATION OF SOME COMPOSITAE SEEDS.

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Introduction. The fact that light can appreciably influence the germination of seeds has been appreciated since as far back as 1881, when Stebler's (1) investigations showed the beneficial influence of light upon the germination of various grass achenes. Since then, it has become clear that while many seeds and fruits are light insensitive as far as germination is concerned, others are very light sensitive. The seeds of many epiphytes and grasses need light for successful germination and all Gesneriaceae and most Loranthaceae seeds need light for germination. On the other hand, light inhibits the germination of the seeds of other plants, such as those of many members of the Liliaceae (1).

Little general information is available about the light responses of Compositae seeds, while virtually nothing is known about this facet of the South African flora. Casual investigations indicate that there are many light sensitive seeds among our native plants, and the influence of light upon the germination of certain Compositae seeds was investigated in some detail.

Aims. The germination of twenty nine species of South African Compositae was studied at a constant temperature, i.e. 26°C, and the influence of light upon this process investigated.

Methods. The seeds used in this investigation were obtained from Kirstenbosch National Botanic Gardens. Hairs and scales were removed, where they existed, and the seeds soaked overnight (15 hours ± 2) in de-ionised water. Only seeds that had swelled were used for this investigation and any seeds with impervious seed coats ("hards") were discarded as they show a different germination pattern to ordinary seeds (2).

All precautions possible were taken to prevent fungal infection and the seeds were plated out onto water-soaked filter paper in heat-sterilized petri dishes. The filter paper was renewed regularly.

Batches of 100 seeds were used for each treatment. One batch of each species was left in a darkened incubator while the other batch was left in an illuminated incubator. Both were maintained at 26°C.

Germination counts were made daily and the criterion of germination used was the emergence of the radical.

Results. Table I. shows the general results obtained. Under the conditions of the experiment there was a great range in the percentage of germination. Some seeds, like those of *Senecio grandiflorus*, showed very good germination, while others, like *Gamolepis chrysanthemoides*, had very poor germination. Of the twenty-nine species investigated eight did not germinate at all, although they were left for over two months in the incubators. On the basis of their percentage germination, these seeds can be separated into five clearly distinct groups, which are shown in this table.

In all the species that germinated, light influenced this process. In all,

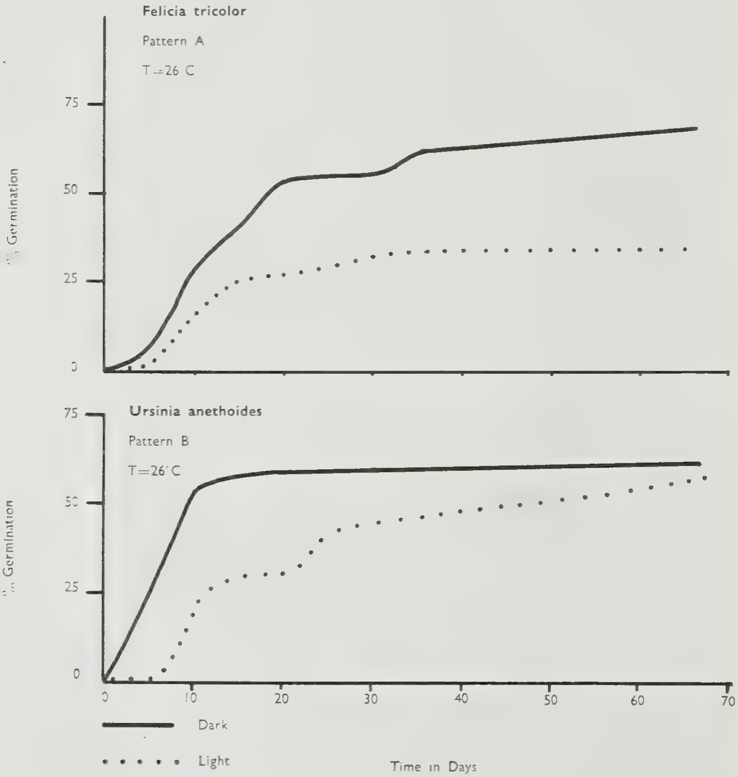

FIG. 1. Germination patterns of *Felicia tricolor* and *Ursinia anethoides*.

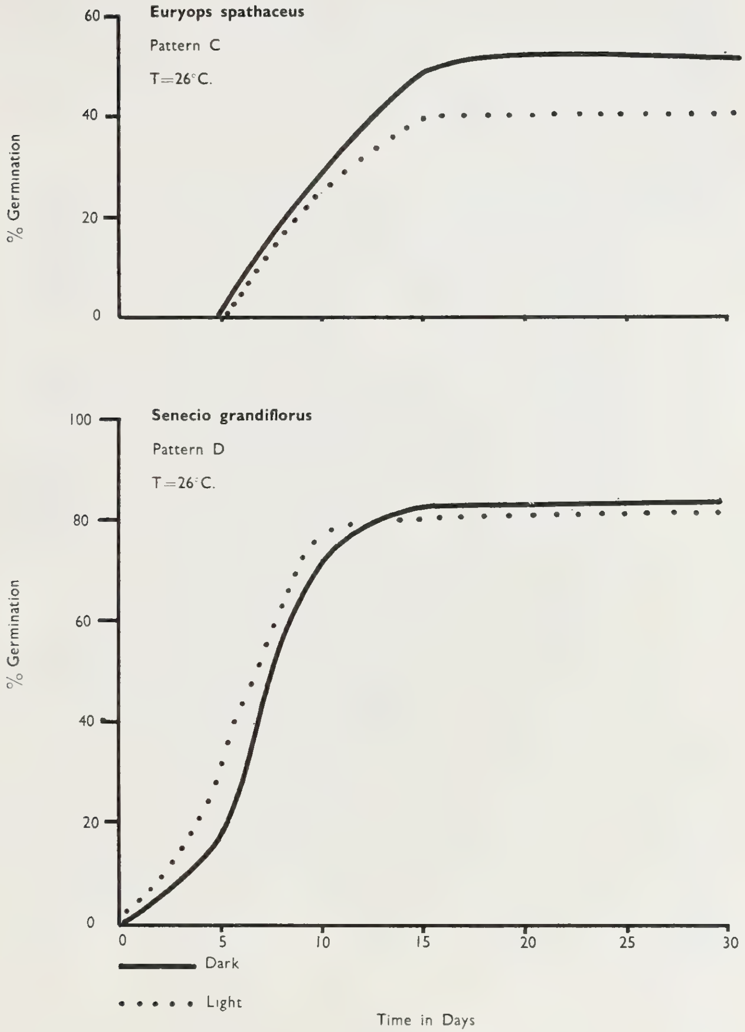

FIG. 2. Germination patterns of *Euryops spathaceus* and *Senecio grandiflorus.*

except two very poorly germinating species, germination was better in the dark. In species such as *Felicia bergeriana* (dark 83%, light 39%) and *Euryops abrotanifolius* (dark 36%, light 0%) the differences are very spectacular, and can easily be observed in Table I. In others the influence of light can only be observed clearly if germination graphs are studied. These show the rates of germination; the germination patterns may be quite distinct, even though the final germination percentage may be very similar.

If the germination rates of the first three groups in Table I are plotted graphically, four clearly distinct patterns are discernible.

(A) Where there is a marked discrepancy between the germination rates of the darkened and of the illuminated seeds. This discrepancy is maintained throughout, as can be clearly seen in the graph of *Felicia tricolor* (Fig. 1).

(B) Plants in which a large initial difference in germination rate gradually decreases, resulting in small differences in the total percentage germination. *Ursinia anethoides* is the only example of this in the present investigation (Fig. 1).

(C) In this group, the initial rate of germination does not appear to be influenced by light, but with time the influence of light becomes very apparent. *Euryops spathaceus* exemplifies this group (Fig. 2).

(D) Plants in which there is no very marked difference in germination rate or pattern and in which the final percentage germination is approximately the same in both treatments. *Senecio grandiflorus* is an example of such a plant (Fig. 2). However, even here, light significantly influences germination.

Conclusion. Under the constant temperature conditions of the experiment, light influences the germination rate of all the species whose seeds germinated. In general, the light retarded seed germination, in many cases very considerably. In only two cases, *Gazania pinnata* and *Arctotis acaulis*, both of which showed very poor germination, was there better germination in the light than in the dark. About one quarter of the species did not germinate at all under the conditions of the investigation.

We are much indebted to Professor H. B. Rycroft, Director of the National Botanic Gardens, Kirstenbosch, for supplying the seeds for this investigation.

REFERENCES

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TABLE I

Germination of Compositae seeds, at a temperature of 26°C. Duration of investigation was two months. For details see text.

Group	*Species*	*Percentage of Germination*		*Germination Pattern Type*
		Dark	*Light*	
Group I High percentage of germination	Senecio grandiflorus	83%	82%*	D
	Senecio arenarius	89%	88%*	D
	Oldenburgia arbuscula	83%	74%*	C
Group II Fairly high percentage of germination	Felicia tricolor	68%	39%	A
	Felicia rotundifolia	72%	51%	A
	Felicia bergeriana	83%	39%	A
	Euryops spathaceus	54%	40%*	C
	Ursinia anethoides	63%	59%	B
	Ursinia speciosa	67%	36%	A
	Psilothonna speciosa	51%	46%*	C
Group III Moderate germination	Dimorphotheca pluvialis	54%	6%	A
	Euryops abrotanifolius	36%	0%	A
	Charieis heterophylla	33%	19%	A
	Felicia aethiopica var.	23%	11%	A
Group IV Poor germination	Felicia aethiopica	3%	3%	
	Euryops athanasia	5%	4%	
	Oldenlandia natalensis	6%	1%	
	Gamolepis chrysanthemoides	2%	2%	
	Venidium hirsutum var.	1%	0%	
	Arctotis acaulis	3%	4%	
	Gazania pinnata	1%	6%	
Group V. No germination	Senecio elegans			
	Osteospermum ecklonii			
	Osteospermum amplectens			
	Helichrysum fulgidum			
	Phoenocoma prolifera			
	Eriocephalus africanum			
	Eriocephalus racemosus			
	Athanasia parifolia			

* Calculations show that there is a statistically significant difference between these treatments.